DECLARATION

I, Jeffrey C. Barfield of Alpenrosenstrasse 3, 82377 Penzberg, Germany, do hereby declare that I am conversant with the English and German languages and that I am a competent translator thereof.

I verify that the attached English translation is a true and accurate translation of the German language Annex (plus enclosures) of the International Preliminary Report on Patentability dated August 31, 2005 with respect to the patent application WO 2005/066540 A1 having the international file reference PCT/EP2004/013463 with the application date November 26, 2004.

Date: June 1, 2006

Jeffrey C. Barfield

TRANSLATION

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY (ANNEX)

International File No.
PCT/EP2004/013463

Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

The closest prior art: D1 (DE-A-10151958) shows a lighting apparatus having the features of the preamble of the only independent claim 1, in particular having downlight reflectors which have a front reflector opening and a rear reflector opening and which are illuminated by a common illuminant through the rear reflector openings; the lighting apparatus has a direct light discharge region which is surrounded by a diffuse light discharge region.

The subject of claim 1 differs from this known lighting apparatus in that the **diffuse light discharge region can be illuminated directly** by the section of the illuminant disposed outside the rear reflector opening.

It is the object of the invention to further develop the known lighting device such that the impression of downlights arranged adjacent to one another in rows can be achieved, with it simultaneously being ensured that the diffusion light discharge region emits a clearly perceivable light portion.

The different characterizing features of claim 1 are neither known nor made obvious by the searched prior art.
The subject matter of independent claim 1 is therefore novel (PCT Article 33(2)).

Claims 2 to 22 are dependent on claim 1 and thus likewise satisfy the requirements of the PCT with respect to novelty and inventive step.

Hartmut S. Engel E2796PWO – Mr/ho

A lighting device

This invention relates to a lighting device comprising a plurality of downlight reflectors illuminated by an illuminant in accordance with the preamble of claim 1.

Lighting devices of the named kind as a rule consist of a plurality of individual downlights which each have their own housing and which are each arranged at different positions in dependence on the technical lighting demands prevailing on site in the ceiling region of a room. Such downlights are frequently also arranged directly adjacent to one another or used in combination with strip lamps and/or louver lamps whose size e.g. coincides with the size of ceiling elements of suspended grid ceilings.

The fact is disadvantageous in lighting devices of the said type that downlights and strip lamps or louver lamps have different designs and thus do not present a uniform appearance. Furthermore, servicing, in particular the cleaning and replacing of illuminants, is associated with a comparatively high effort when individual downlights are used.

A strip lamp is known from document DE 101 51 958 A which has a plurality of pot reflectors which are arranged in a row, which are coupled to one another via a light permeable connection plate and which are acted

on by light via a common illuminant via rear openings of the pot reflectors. The connection plate can be made frosted in this connection. In this case, the frosted connection plate then forms a diffuse light discharge region which surrounds the direct light discharge regions of the pot reflectors. The fact is disadvantageous in this embodiment that the light amount incident onto the connection plate is not sufficient to provide a clearly perceivable diffuse light discharge region.

A further strip lamp is known from document EP 0 359 069 which, for example, has a plurality of parabolic louver chambers which can each be illuminated via a common fluorescent lamp via rear openings such that ultimately the effect of round spots arranged in rows with one another is achieved.

Further lighting devices are known from US 2002/0064047 A and US 2002/002815 A.

An object of the invention consists of further developing a lighting device known from document DE 101 51 958 A such that, on the one hand, the impression of downlights arranged in rows with one another is achieved by a single such lighting device, with it simultaneously being ensured that a diffuse light discharge region surrounding the existing direct light discharge regions emits a clearly perceivable light amount.

This object is satisfied in accordance with the invention in that the diffuse light discharge regions can be illuminated directly by sections of the lamp

disposed outside the rear reflector openings.

In accordance with the invention, the front reflector openings of the downlight reflectors define direct light discharge regions which are at least regionally surrounded by at least one diffuse light discharge region. Consequently, it is possible to work according to the dark-light principle in the direct light discharge region, according to which principle the illuminant and the reflector are arranged with respect to one another such that the illuminant can no longer be seen from a specific angle of observation and thus cannot develop any glare effect. At the same time, however, scattered light exits the diffuse light discharge region in accordance with the invention around the said direct light discharge region, said scattered light being visible as non-glaring ambient light so that it is always ensured that the observer can perceive where the respective light source is located. This results in a room mood with a good light atmosphere perceived as pleasant despite the use of the dark light principle. In addition, a generation of softer shadows and an advantageous wall brightening is achieved by the scattered light being discharged through the diffuse light discharge region. In addition to these advantages, interesting design possibilities result from the diffuse light discharge region, for example by an individual choice of the shape of the diffuse light discharge region or of the color of the discharged scattered light.

It is achieved by the measure in accordance with the invention, in accordance with which tbe diffuse light discharge regions are also illuminated directly by the illuminant in addition to the direct light discharge regions, that the diffuse light discharge regions also appear sufficiently bright without any loss in the efficiency of the direct light radiation so that a

scattered light amount is always discharged from the diffuse light discharge regions for the achieving of the advantageous effects described above.

In accordance with the invention, two or more downlight reflectors are

~~unique design can even be achieved with the combined use of individual~~ downlights and strip lamps or louver lamps, with the effort for the servicing of the lighting device in particular being reduced.

This object is satisfied in accordance with the invention in that at least two downlight reflectors can be illuminated by a common illuminant via a respective rear reflector opening.

In contrast to the lighting devices known from the prior art, in which a separate illuminant and, as a rule, also a separate housing are provided ~~for each downlight reflector, two or more downlight reflectors are~~ now illuminated by a common illuminant in accordance with the invention, which advantageously has the result that only one single illuminant has to be serviced or replaced as required in connection with the said two or more downlight reflectors. The servicing effort is thereby substantially reduced by the use of a lighting device in accordance with the invention. Furthermore, in accordance with the invention, a plurality of downlight reflectors illuminated by a common illuminant can be arranged next to one another, in particular along a straight line or along a plurality of lines extending in parallel so that these downlight reflectors ultimately have a lighting characteristic similar to a strip lamp or a louver lamp as a group. The use of such a group acting as a strip lamp or louver lamp together with individual downlights thus permits a uniform and matched design of a lighting system consisting of the named components.

desired manner by this pivoting capability. The different downlight reflectors illuminated by a common illuminant can be pivoted either independently of one another or, via a suitable mechanical coupling, together with one another.

In particular when the downlight reflectors can be pivoted independently of one another, it is sensible for the illuminant acting on the downlight reflectors to be arranged statically in the housing so that it is not taken along in the said pivot movements. If, however, the downlight reflectors, can be pivoted together with one another, the illuminant acting on them can again either be arranged statically in the housing or can be mechanically coupled to the downlight reflectors such that the illuminant is carried along in the pivot movement of the downlight reflectors. In the latter case, an optimum relative position can be ensured in every pivot angle position between the illuminant and the downlight reflectors and thus an optimum action of the downlight reflectors via the illuminant.

~~In a particularly preferred embodiment of the invention, the front reflector~~ openings of the downlight reflectors can define direct light discharge regions which are surrounded at least regionally by at least one diffuse light discharge region. In this case, it is possible to work according to the dark-light principle in the direct light discharge region, according to which principle the illuminant and the reflector are arranged with respect to one another such that the illuminant can no longer be seen from a specific angle of observation and thus cannot develop any glare effect. At the same time, however, scattered light exits the diffuse light discharge region in accordance with the invention around the said direct light discharge ~~region, said scattered light being visible as non-glaring ambient light so~~

~~that it is always ensured that the observer can perceive where the respective~~ light source is located. This results in a room mood with a ~~good~~ light atmosphere perceived as pleasant despite the use of the ~~dark~~ light principle. In addition, a generation of softer shadows ~~and~~ an advantageous wall brightening is achieved by the ~~scattered~~ light being discharged through the diffuse light discharge region.

In addition to these ~~advantages~~, interesting design possibilities result from the diffuse light ~~discharge~~ region, for example by an individual choice of the ~~shape~~ of the diffuse light discharge region or of the color of the ~~discharged scattered~~ light.

In particular with the use of a plurality of illuminants of different color shades which act jointly on both the direct light discharge region and on the diffuse light discharge region, it is of advantage that a particularly good mixing of the different color shades results in the region of the diffuse light discharge region.

As already mentioned above, the direct light discharge regions and the diffuse light discharge regions can be illuminated by a common illuminant so that ultimately any existing illuminant acts on all direct light discharge regions of the different downlight reflectors and simultaneously on all diffuse light discharge regions. In this manner, it is not necessary to provide separate illuminants for the diffuse light discharge regions, which is advantageous with respect to the illuminant costs and the effort to be carried out on a changing of the illuminants

The front reflector openings defining the direct light discharge regions can be associated with a respective direct light reflector made as a downlight reflector in accordance with a preferred embodiment on whose side remote from the direct light discharge region an additional reflector or

1. A lighting device comprising a plurality of downlight reflectors (1) which are illuminated by an illuminant and which each have a front reflector opening disposed in the direction of illumination, wherein at least two downlight reflectors (1) can be illuminated by a common illuminant (5, 5") via a respective rear reflector opening, and wherein the front reflector openings (2) define direct light discharge regions (8) which are surrounded at least regionally by at least one diffuse light discharge region (7),
characterized in that
the diffuse light discharge regions (7) can be illuminated directly by sections of the illuminant (5, 5") disposed outside the rear reflector openings (3).

18. A lighting means in accordance with claims 16 and 17, characterized in that the sections of the illuminant (5) disposed outside the rear reflector openings (3) are arranged such that the diffuse light discharge regions (7) can be illuminated directly, on the one hand, and indirectly, on the other hand, via the reflecting outer sides of the direct light reflectors (1) and the reflecting inner sides (15) of the housing (14).

21. A lighting means in accordance with any one of the claims 19 or 20, characterized in that the diffuse light discharge regions (7) of a plurality of downlight reflectors (1) are formed by a common rectangular scattering plate.

22. A lighting means in accordance with claim 21, characterized in that the common rectangular scattering plate is made integrally with a transparent plate (6) terminating the front reflector openings (6).

~~11. A lighting means in accordance with claim 10, characterized in that the downlight reflectors (1) are held pivotally in the housing (14) together with the illuminant (5, 5") acting on them, with additional wall elements (9, 10, 12) through which scattered light passes in particular becoming visible with outwardly pivoted downlight reflectors (1).~~

12. A lighting means in accordance with any one of the ~~preceding~~ claims, characterized in that the front reflector openings ~~(2)~~ define direct light discharge regions (8) which are surrounded at least ~~regionally by at least one diffuse light discharge region (7).~~

12~~3~~. A lighting means in accordance with any one of the preceding claims~~claim 12~~, characterized in that direct light discharge region (8) and diffuse light discharge region (7) can be illuminated by a common illuminant (5, 5").

13~~4~~. A lighting means in accordance with any one of the preceding claim~~sany one of the claims 12 or 13~~, characterized in that the reflector openings (2) defining the direct light discharge regions (8) are each associated with direct light reflectors (1) on whose side remote from the respective direct light discharge region (8) an additional reflector or background reflector is provided.

14~~5~~. A lighting means in accordance with ~~any one of the claims 13 or 14~~claim 13, characterized in that a light passage region is formed between the additional reflector (15) and the direct light reflector (1).

15~~6~~. A lighting means in accordance with any one of the claims 13 ~~to~~ or 14~~15~~, characterized in that the additional reflector (15) is formed at least partly by at least one planar reflector surface or one presettably - in particular rotationally symmetrically - curved reflector surface or one kinked reflector surface which ensures a presettable division of the portion of the reflected light guided to the direct light discharge region (8) and to the diffuse light discharge region (7).

16~~7~~. A lighting means in accordance with any one of the preceding claims~~any one of the claims 13 to 16~~, characterized in that the illuminant (5, 5") and the direct light reflectors (1) are arranged in a housing (14) which is in particular lightproof and/or dust-proof and whose inner surface is made at least regionally as an additional reflector (15).

17~~8~~. A lighting means in accordance with any one of the preceding claims~~any one of the claims 12 to 17~~, characterized in that the direct light reflectors (1) are made specularly reflecting or diffusely reflecting at their outer sides.

~~19. A lighting means in accordance with any one of the preceding claims, characterized in that the housing in accordance with claim 5 is terminated in an at least largely dustproof manner by a scattering plate in the region of the diffuse light discharge region (7) and by an in particular transparent plate (6) in the region of the direct light discharge regions (8).~~